NON-PUBLIC?: N
ACCESSION #: 9408230194
LICENSEE EVENT REPORT (LER)

FACILITY NAME: North Anna Power Station Unit 2 PAGE: 1 OF 5

DOCKET NUMBER: 05000339

TITLE: AUTOMATIC REACTOR TRIP DUE TO CLOSURE OF MAINE FEEDWATER
REGULATING VALVE
EVENT DATE: 01/22/94 LER #: 94-003-01 REPORT DATE: 08/15/94

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Mr. J. A. Stall TELEPHONE: (703) 894-2101

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: SJ COMPONENT: FCV MANUFACTURER: C600
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On January 22, 1994, at 0644 hours with Unit 2 operating at 95 percent power (Mode 1) an automatic reactor trip occurred. The initiating signal was the "A" Steam Generator (SG) low level coincident with a steam flow greater than feedwater flow mismatch caused by closure of the "A" Main Feedwater Regulating Valve (MFRV). This resulted in a reactor and turbine trip. A four hour report was made to the NRC at 1014 hours pursuant to 10 CFR 50.72 (b)(2)(ii) and (vi). This event is reportable pursuant to 10CFR50.73 (a)(2)(iv) as an automatic actuation of a Reactor Protection System.

The cause of the "A" MFRV closure was due to a component failure of the upper pneumatic booster relay on the valve positioner.

No significant safety consequences resulted from this event because all

safety systems responded appropriately. Therefore, the health and safety of the public were not affected at any time during this event.

END OF ABSTRACT

1.0 Description of the Event

On January 22, 1994, at 0644 hours with Unit 2 operating at 95 percent power (Mode 1) an automatic reactor trip occurred. The initiating signal was the "A" Steam Generator (SG) (EIIS System AB, Component SG) low level coincident with a steam flow greater than feedwater flow mismatch. The initiating signal was caused by closure of the "A" Main Feedwater Regulating Valve (MFRV) (EIIS System SJ, Component FCV). This resulted in a reactor and turbine trip. A four hour report was made to the NRC at 1014 hours pursuant to 10 CFR 50.72 (b)(2)(ii) and (vi). This event is reportable pursuant to 10CFR50.73 (a)(2)(iv) as an automatic actuation of a Reactor Protection System.

On January 21, 1994, at 2328 hours Unit 2 was ramped down to 95 percent power to aid in controlling steam generator levels when the "A" MFRV malfunctioned causing an overfeed condition. Steam generator level control was obtained by using the main feedwater regulating bypass valve (EIIS Component FCV) and throttling the MFRV motor operated isolation valve (EIIS Component ISV). The "A" MFRV was then placed in manual override to facilitate troubleshooting and repair activities. Troubleshooting determined the "A" MFRV positioner's current to pneumatic (I/P) transducer (EIIS Component TD) air supply regulator (EIIS Component RG) had failed. Following replacement of the regulator and I/P transducer, the latter replaced as a precautionary measure, Operations personnel attempted to restore the "A" MFRV to auto-control in accordance with station procedures. The "A" MFRV exhibited stable conditions for approximately 15 seconds then commenced a slow ramp to the closed position. The MFRV did not respond to demand input from the Main Control Room. The resultant SG low level coincident with a steam flow greater than feedwater flow mismatch initiated the automatic reactor trip signal.

Control Room Operators responded to the event in accordance with Emergency Procedure E-0, Reactor Trip or Safety Injection. Reactor Coolant System (EIIS System AB) temperature and pressure decreased to approximately 539 degrees Fahrenheit and 1920 psig before recovering to 547 degrees Fahrenheit and 2235 psig. Plant safety equipment responded appropriately during the reactor trip.

After event investigation and corrective actions were completed, Unit 2

was taken to critical at 2332 hours on January 22, 1994. It was determined that closure of the "A" MFRV was caused by a failure of the upper pneumatic booster relay (EIIS System SJ, Component RLY) on the valve positioner.

2.0 Significant Safety Consequences and Implications

No significant safety consequences resulted from this event because all safety systems responded appropriately. Therefore, the health and safety of the public were not affected at any time during this event.

3.0 Cause of the Event

The overfeed malfunction of the "A" MFRV was due to failure of the valve positioner's I/P air supply regulator. The automatic reactor trip occurred as a result of the "A" Steam Generator (SG) low level coincident with a steam flow greater than feedwater flow mismatch caused by closure of the "A" Main Feedwater Regulating Valve (MFRV).

Closure of the "A" MFRV was due to a failed upper pneumatic booster relay on the valve positioner. The Root Cause Evaluation (RCE) of the pneumatic booster relay failure has determined that the metal washer staked into the booster body failed to hold the delrin seat in place. The failed staked connection allowed the washer and delrin seat to drop out of place and cause the booster to continuously supply air at approximately 105 psig, on top of the MFRV to close it.

The upper booster relay failed after isolating air to the valve and before or during restoration of air to the valve following troubleshooting. The demands placed on the upper booster relay during the time the valve was on manual override aggravated a manufacturing defect and contributed to the failure. The booster relay was sent to the manufacturer for examination. The manufacturer determined the failure of the delrin pilot valve seat was a result of the staking process not flowing an adequate amount of material over the washer to retain the seat at high supply pressures. In a random test case, the manufacturer was able to cause seat failure with as little as sixty five pounds of force. Our normal instrument air system pressure exerts thirty two pounds of force on the pilot valve. The manufacturer has subsequently modified their staking tool and process.

In addition, while implementing a portion of the procedure which returns the valve to normal control from override, several operators and instrument technicians noted an unusual amount of air venting from the

lower booster. A note in the procedure stated to expect air to blow out of boosters on reposition of the positioner lever. The note was referred to and work continued. Although it is expected that air will blow during parts of the procedure, the note tended to confuse the excessive air relief of the failed booster with valid air balancing. This precluded the opportunity to troubleshoot the failed booster when returning the valve to normal control.

4.0 Immediate Corrective Actions

Following the reactor trip emergency Procedure 2-E-0, Reactor Trip or Safety Injection, was entered. Transition to Emergency Procedure 2-ES-0.1, Reactor Trip Response, occurred and unit conditions were stabilized. The "A" MFRV upper pneumatic booster relay was replaced and post maintenance testing was satisfactorily completed.

5.0 Additional Corrective Actions

The failed positioner air supply regulator was disassembled (i.e. cut apart) for evaluation. This evaluation did not identify any abnormalities which could have caused the regulator to fail.

6.0 Actions to Prevent Recurrence

The RCE identified appropriate corrective actions regarding the pneumatic booster relay. These include: revising the maintenance operating procedure to further enhance and explain the notes regarding air venting and to add contingency steps using the instrument air to stop runaway valve movement during the procedure, evaluate the removal of the booster relays from the MFRVs, training of this event and enhanced training to operators and instrument technicians on placing the actuator on manual override and returning it to normal. These actions have been completed.

The pneumatic booster relays were replaced on all three MFRVs for Unit 2. Work Orders have been initiated to replace the booster relays on the Unit 1 MFRVs during the next outage of sufficient duration.

7.0 Similar Events

North Anna has experienced automatic reactor trips due to MFRVs closing. However, the MFRV closures were due to driver card failures and/or instrument air line fatigue failure. There have been no similar events where the MFRV closed due to a pneumatic booster relay failure.

8.0 Additional Information

Unit 1 was operating at 100 percent power (mode 1) when the reactor trip occurred and was not affected by this event. Failed component information for the "A" MFRV:
F/R Booster Relay
Manufacturer - Moore Products Company
MOD - 61H
B/M - 10342-/22NF

10 CFR 50.73

Virginia Electric and Power Company
North Anna Power Station
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August 15, 1994

U. S. Nuclear Regulatory Commission NAPS:MPW
Document Control Desk Docket No. 50-339
Washington, D.C. 20555 License No. NPF-7

Dear Sirs:

Pursuant to North Anna Power Station Technical Specifications, Virginia Electric and Power Company hereby submits the following Licensee Event Report Supplement applicable to North Anna Unit 2.

Report No. 50-339/94-003-01

This Report has been reviewed by the Station Nuclear Safety and Operating Committee and will be forwarded to the Management Safety Review Committee for its review.

Very truly yours,

J. A. Stall
Station Manager

Enclosure:

cc: U.S. Nuclear Regulatory Commission
101 Marietta Street, N.W.
Suite 2900
Atlanta, Georgia 30323

R. D. McWhorter
NRC Senior Resident Inspector
North Anna Power Station

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